

	<p>Use each integer from 4 to 13, inclusive, exactly once to fill the circles so that each side of the kite has a sum of 29.</p> 	<p>Dashia rolled three standard six-sided dice. The product of the “up” faces was 36. What possible sums might she roll?</p>	<p>Find the number of integral solutions to the inequality</p> $x^2 + y^2 \leq 9.$
	1	2	3
<p>The angle measures of a convex octagon are in arithmetic progression. Find the smallest possible measure for the smallest angle if all the angle measures are integers.</p>	<p>Use each integer from 1 to 9, inclusive, exactly once to write a numerical expression equal to 2012. An integer may be written as an exponent, and the operations of addition, subtraction, multiplication, and division as well as grouping symbols may be used.</p>	<p>Miss Muffet made a net for a square pyramid. The base edges are 12 in., and the triangular faces are equilateral. Along comes a spider to the midpoint of \overline{VD}. What is the shortest distance the spider can traverse to reach a tasty bug at the midpoint of $\overline{V'E}$.</p> 	<p>Miss Muffet (see problem 6) folded up the lateral faces of her square pyramid net without noticing either the spider or the bug. If the spider remained at the midpoint of \overline{VD} and the bug were still at the midpoint of $\overline{V'E}$, what is now the shortest distance for the spider to travel to reach the bug?</p>
4	5	6	7
<p>Consider the following sequence, which consists of 2s and 9s only:</p> $2, 9, 2, 2, 9, 2, 2, 2, 9, 2, 2, 2, 9, \dots$ <p>A single 9 separates each group of 2s, and each group of 2s contains one more 2 than the previous group of 2s. What is the sum of the terms that precede the 29th 9?</p>	<p>The integer 2012 has two prime factors, 2 and 503. The average number of distinct prime factors for numbers less than 100,000,000 is about 2.9. Find the integer closest to 2012 whose number of prime factors is above the average.</p>	<p>An ordinary piece of graph paper is folded once so that the point with coordinates $(-3, -5)$ coincides with the point with coordinates $(29, 11)$. At what point does the fold line intersect the y-axis?</p>	<p>If</p> $\frac{2^2 - 2^{-1} - 2^a}{2^0 + 2^{-2} - 2^3} = -2^{-1},$ <p>find the value of a.</p>
8	9	10	11
<p>The faces of a fair die show the six divisors of 2012. If the die is rolled twice, what is the probability that the sum of the rolls is itself a divisor of 2012?</p>	<p>Hannah created the well-known tangram square on a square-array geoboard with five pegs on a side. Show how she can create a similar tangram square that encloses half the area on the same board. Every vertex of each of the seven tangrams must lie at a peg.</p> 	<p>Graph the relation</p> $\frac{x^2}{100} + \frac{y^2}{25} = 1$ <p>subject to the constraint $y < x$. On the same coordinate plane, graph the relation</p> $\frac{x^2}{25} + \frac{y^2}{100} = 1$ <p>subject to the constraint $y > x$. What shape do you obtain?</p>	<p>How many digits are in the base-2 representation of 2012? Can you answer this question without using pencil, paper, or calculator?</p>
12	13	14	15
<p>A paper square is folded so that a corner of the paper coincides with the midpoint of an opposite side. Show that the three regions where the folded paper has a single layer consists of three similar triangles with sides in the ratio 3:4:5.</p>	<p>A pouch contains twice as many white marbles as green marbles. One-third of all the marbles are chipped, and the number of chipped green marbles equals the number of chipped white marbles. If a single marble, selected at random, is white, what is the probability that it is chipped?</p>	<p>Find the sum of the first 50 terms of the following sequence:</p> $1 + 3 - 5 + 7 + 9 - 11 + 13 + 15 - 17 + \dots$	<p>Rectangle $ABCD$ has side $AB = 12$ and side $BC = 8$. A point P in the interior of the rectangle is selected at random. What is the probability that the area of $\triangle PBC$ is greater than 20?</p>
16	17	18	19
<p>Connect every other vertex of a regular octagon to form a square. Connect the remaining vertices to form a second square. The points of intersection of the two squares are the vertices of a second regular octagon. What is the scale factor of the larger octagon to the smaller one?</p>	<p>The graphs of</p> $y = - x + 8 + 6, y = 0, \text{ and } y = x + k$ <p>bound a trapezoid in quadrant II. If the area of the trapezoid is 20, what is the value of k?</p>	<p>Tamir drives 21 miles to work each day. When he leaves home 10 min. late, his travel time increases by 40%. If leaving late decreases his average rate by 12 mph, how long does his commute take when he leaves on time?</p>	<p>Two thousand patriotic millionaires each decided to contribute 15% of their net worth to reduce the national debt. An equally patriotic billionaire decided to match the gifts. If each millionaire's net worth is exactly 1 million dollars and the billionaire's worth is exactly 1 billion dollars, what percentage of her net worth did the billionaire need to give to match the gifts?</p>
20	21	22	23
<p>The quadratic equation</p> $2ax^2 - 4ax + a + 1 = 0$ <p>has two rational roots. If one root is three times the second root, what is the value of a?</p>	<p>A circle with radius 1 is tangent to both sides of a 60° angle. A second circle, larger than the first, is tangent to the first circle and to both sides of the angle. Find the radius r of the second circle.</p>	<p>Square $ABCD$ has points W, X, Y, and Z that are trisection points of the sides of the square. W, X, Y, and Z are connected to form a rectangle. Find the ratio of the perimeter of $WXYZ$ to the perimeter of $ABCD$.</p> 	<p>If the ratio of $x + 2y$ to $5y - x$ is 3 to 5, what is the ratio of x to y?</p>
24	25	26	27
<p>For what values of k will the graphs of the following equations intersect in quadrant III?</p> <p>line $l: y = kx + 14$ line $m: y = x + 28$</p>	<p>Six high school athletes compared their best long-jump distances. The range was 2 ft., and the interquartile range was 1 ft. Distances were recorded to the nearest half in., and no two athletes had the same personal best. If the longest jump—23 ft. 3.5 in.—exceeded the second-longest jump by 9.5 in., what is the smallest possible mean for these data?</p>		
28	29		